Mono-2-ethylhexyl phthalate

CAS No. 4376-20-9

Metabolite of di-2-ethylhexyl phthalate (CAS No. 117-81-7)

Di-2-ethylhexyl phthalate is primarily used to produce flexible plastics, mainly polyvinyl chloride, which is used for many home and garden products, food containers, toys, and blood-product storage and delivery systems. Concentrations in plastic materials may reach 40% by weight. Di-2-ethylhexyl phthalate has been removed from or replaced in most children's toys and food packaging in the United States. Other sources of exposure include food, such as milk, cheese, and fish, with fatty foods containing higher levels. People exposed to di-2-ethylhexyl phthalate will excrete mono-2-ethylhexyl phthalate in their urine.

Generally, di-2-ethylhexyl phthalate has low acute toxicity. The metabolite, mono-ethylhexyl phthalate, is considered to be a more toxic compound than the parent phthalate. Liver toxicity and testicular toxicity have been observed in animal studies at high doses and chronic doses. Recently, the U.S. Food and Drug Administration (FDA) considered the amounts of di-2-ethylhexyl phthalate or mono-2-ethylhexyl phthalate (the latter is formed *in situ* in blood from di-2-ethylhexyl phthalate) received from medicinal delivery systems to be below

Table 70. Mono-2-ethylhexyl phthalate

Geometric mean and selected percentiles of urine concentrations (in µg/L) for the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 1999-2000.

	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)						Sample size
		10th	25th	50th	75th	90th	95th	
Total, age 6 and older	3.43 (3.19-3.69)	< LOD	1.20 (<LOD-1.40)	3.20 (2.90-3.50)	7.60 (6.80-8.20)	14.8 (13.6-17.3)	23.8 (19.2-28.6)	2541
Age group								
6-11 years	5.12 (4.25-6.16)	< LOD	2.40 (1.80-3.10)	4.90 (3.80-5.50)	11.1 (7.70-13.7)	19.0 (13.7-36.1)	34.5 (14.7-130)	328
12-19 years	3.75 (3.30-4.27)	< LOD	1.60 (1.30-1.80)	3.70 (2.90-4.50)	8.10 (6.30-9.60)	15.0 (11.5-20.2)	22.8 (19.5-26.3)	752
20 years and older	3.21 (2.95-3.49)	< LOD	< LOD	3.00 (2.60-3.30)	7.20 (6.30-8.10)	14.2 (12.2-16.5)	22.4 (16.8-27.8)	1461
Gender								
Males	3.68 (3.26-4.15)	< LOD	1.40 (1.20-1.80)	3.40 (2.80-4.10)	8.00 (6.80-9.10)	16.0 (13.8-20.2)	25.3 (18.3-38.3)	1215
Females	3.21 (2.93-3.51)	< LOD	1.20 (<LOD-1.40)	3.00 (2.70-3.50)	7.00 (5.90-8.10)	13.5 (11.4-15.2)	21.6 (17.2-26.0)	1326
Race/ethnicity								
Mexican Americans	3.49 (3.13-3.88)	< LOD	1.50 (<LOD-1.70)	3.50 (3.00-3.70)	7.00 (5.90-8.60)	13.3 (10.7-19.1)	23.9 (16.4-29.3)	814
Non-Hispanic blacks	4.82 (4.07-5.71)	< LOD	2.50 (1.70-3.00)	5.10 (4.10-5.90)	9.40 (7.80-11.2)	19.5 (14.6-24.5)	29.2 (19.5-39.3)	603
Non-Hispanic whites	3.16 (2.89-3.46)	< LOD	< LOD	2.70 (2.50-3.10)	7.30 (6.30-8.20)	14.4 (12.2-16.6)	22.4 (16.5-29.3)	911

< LOD means less than the limit of detection, which is 1.2 µg/L.

thresholds likely to cause injury in adults. However, in lifesaving instances, in which neonates would receive exchange blood transfusions, relatively higher exposures might occur (http://www.fda.gov/cdrh/ost/dehp-pvc.pdf).

Workplace air standards for external exposure to di-2-ethylhexyl phthalate are generally established (OSHA, ACGIH). It is classified as a probable human carcinogen by the U.S. EPA, reasonably anticipated to be a human carcinogen by NTP, but considered not classifiable by IARC. Information about external exposure (environmental levels) and health effects is available from the EPA IRIS Web site at http://www.epa.gov/iris and from ATSDR at http://www.atsdr.cdc.gov/toxprofiles.

Concentrations reported here are similar to those reported in a non-random subsample from NHANES III (Blount et al., 2000). In the current NHANES 1999-2000 subsample, geometric mean levels of the demographic groups were compared after adjustment for the covariates of race/ethnicity, age, gender, and urinary creatinine. Urinary mono-ethylhexyl phthalate levels were higher for ages 6-11 years than for the other two age groups. It is unknown whether differences between ages represent differences in exposure, body-size relationships, or metabolism. A statistical examination of phthalate levels in a non-random subsample from NHANES III (Koo et al., 2002) suggested slightly higher levels in urban populations, low-income groups, and males.

Table 71. Mono-2-ethylhexyl phthalate (creatinine adjusted)

Geometric mean and selected percentiles of urine concentrations (in µg/gram of creatinine) for the U.S. population aged 6 years and older, National Health and Nutrition Examination Survey, 1999-2000.

	Geometric mean (95% conf. interval)	Selected percentiles (95% confidence interval)						Sample size
		10th	25th	50th	75th	90th	95th	
Total, age 6 and older	3.12 (2.92-3.35)	< LOD	1.52 (1.37-1.69)	3.08 (2.81-3.31)	5.88 (5.38-6.27)	10.8 (9.47-12.9)	18.5 (14.0-23.9)	2541
Age group								
6-11 years	5.19 (4.17-6.45)	< LOD	2.56 (2.05-3.33)	5.37 (4.00-6.29)	9.11 (7.51-12.1)	21.6 (11.6-41.9)	41.9 (13.5-86.2)	328
12-19 years	2.53 (2.21-2.89)	< LOD	1.22 (1.03-1.46)	2.31 (2.11-2.60)	5.83 (4.42-6.27)	9.63 (7.78-11.3)	12.1 (11.0-17.3)	752
20 years and older	3.03 (2.80-3.29)	< LOD	< LOD	2.98 (2.72-3.26)	5.55 (4.90-6.04)	10.0 (8.60-12.9)	17.5 (13.4-22.1)	1461
Gender								
Males	2.89 (2.58-3.24)	< LOD	1.33 (1.19-1.52)	2.76 (2.37-3.18)	5.58 (4.67-6.11)	10.3 (8.90-13.5)	21.6 (13.3-28.4)	1215
Females	3.36 (3.12-3.63)	< LOD	1.82 (1.63-1.99)	3.33 (3.00-3.66)	6.15 (5.55-6.76)	11.1 (9.33-13.5)	16.3 (12.9-23.7)	1326
Race/ethnicity								
Mexican Americans	3.16 (2.77-3.60)	< LOD	1.54 (1.36-1.79)	3.15 (2.62-3.74)	5.88 (4.92-7.20)	11.6 (10.0-12.6)	15.7 (12.6-23.1)	814
Non-Hispanic blacks	3.11 (2.68-3.61)	< LOD	1.68 (1.31-1.98)	3.13 (2.62-3.37)	5.84 (4.66-7.06)	10.2 (8.77-13.6)	18.4 (11.8-35.2)	603
Non-Hispanic whites	3.09 (2.80-3.41)	< LOD	< LOD	3.08 (2.67-3.48)	5.87 (5.14-6.67)	10.6 (8.74-13.7)	20.0 (13.1-27.7)	911

< LOD means less than the limit of detection (see previous table).